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OPPORTUNITIES FOR APPLIED BEHAVIOR ANALYSIS IN THE TOTAL QUALITY MOVEMENT

WILLIAM K. REDMON
WESTERN MICHIGAN UNIVERSITY

In recent years, industry in the United States has focused on quality improvement as a means of enhancing our competitive position worldwide (Deming, 1982; Ishikawa, 1985; Juran, 1989; Walton, 1986). The most well-known programs include statistical process control (SPC) (Deming, 1986) and total quality management (TQM) (Berry, 1991), which gained their popularity in Japan and, later, were adopted in the United States. Applied behavior analysts have become involved in this movement to some extent and have studied a variety of quality interventions (e.g., Henry & Redmon, 1990; Krigsman & O'Brien, 1987; Wittkopp, Rowan, & Poling, 1990).

For the most part, behavioral studies of quality have been accomplished at the level of individual performance. In order to become an essential part of future quality movements and make a meaningful contribution in this area, a broader view must be adopted and existing research extended. The purposes of this paper are to (a) identify critical components of recent quality programs and (b) specify how applied behavior analysis might contribute to quality technology in a more comprehensive way.

Statistical Process Control and Total Quality Management

SPC and TQM are virtually household words. SPC was first developed in the 1930s by Shewhart (1939) and was later elaborated by others, most notably Deming (1982), who built an entire management philosophy around statistical inspection techniques. In it simplest form, SPC refers to the monitoring of statistical samples of a process to determine if the process is operating within acceptable limits on critical dimensions; evidence of drift from standards sets the occasion for immediate correction of faulty conditions. Deming's SPC philosophy includes requirements for management of quality processes as well as specifications for statistical sampling and decision making (see Mawhinney, 1992, for a review).

Total quality management (also known as total quality control or company-wide quality control) elaborates Deming's management philosophy and focuses on instilling values consistent with quality *throughout* an organization (Berry, 1991). TQM establishes a quality culture and includes the following general elements: (a) broad goals related to quality as part of an organization's mission (i.e., a vision), (b) changes throughout the organization's culture to make quality a top priority, (c) an organizational structure that includes managers of quality and teams of workers who focus on quality improvement, (d) training of employees at all levels in methods of analyzing quality problems and improving quality, and (e) extensive participation of upper management in all parts of a program (Juran, 1989). The methods of TQM require intensive measurement of quality outcomes and make use of SPC analytical tools (e.g., control charts, pareto diagrams). In most respects, Deming's SPC and TQM are similar in their specifications for management and organization change (Berry, 1991).

SPC, TQM, and Applied Behavior Analysis

SPC and TQM have several critical elements in common, including (a) focus on customer needs to define the mission, (b) linkage of mission with individual performance across all organization levels, (c) intensive measurement of production process or service delivery, and (d) emphasis on employee participation in problem solving and quality improvement.

Address Correspondence and reprint requests to William K. Redmon, Department of Psychology, Western Michigan University, Kalamazoo, Michigan 49008-5052.

Each of these areas requires a specific technology for success. In some areas, behavior analysis can contribute important elements; in others, little can be provided from the current research base. The current and potential contributions of behavior analysis to these areas are described below.

Assessing customer needs. For the most part, TQM relies on verbal reports to determine what customers want and need. Also, direct contact with customers by all levels of an organization is recommended as a means of increasing sensitivity to the effects of products and services on customers. According to Berry (1991), "Customer surveys should be conducted annually and supplemented during the year with focus groups, brief self-mailer point-of-contact surveys (comment cards), and the like" (p. 24). Benchmarking also has been recommended as a means of setting a target for organizational performance (Camp, 1989). Benchmarking involves determining which organizations in a given industry perform best according to indicators of excellence, describing the practices of the exemplar, and adopting similar practices. It is assumed that those who perform best satisfy the customer most. Camp (1989) emphasized that, "The benefits of benchmarking are that functions are forced to investigate external industry best practices and incorporate those practices into their operations. This leads to profitable, high-asset utilization businesses that meet customer needs and have a competitive advantage"(p. 3).

Similar practices have been used by applied behavior analysts to evaluate consumer responses to service programs and behavior-change procedures. Such practices are described in terms of social validity assessment and depend primarily on verbal reports from persons who are affected by service outcomes (Schwartz & Baer, 1991; Wolf, 1978).

Unfortunately, social validity technology is in need of further development. According to Schwartz and Baer (1991),

> Most social validity assessments rely on the use of interviews, questionnaires, or surveys administered by the experimenter (e.g., Fuqua & Schwade, 1986; McMahon & Forehand, 1983; Schwartz, 1991). The subjective nature of this type of information, paired with the possible confounding variables of social contingencies provided by the experimenter (often referred to in other disciplines as "demand characteristics"), often make these data difficult to interpret (see Azrin, Holz, & Goldiamond, 1961, for an empirical case in point). (pp. 194–195)

Schwartz and Baer (1991) proposed an agenda for future research that could well place behavior analysts at the forefront of consumer measurement technology. They recommended that (a) more social validity assessments be done and reported (positive and negative), (b) samples be expanded beyond immediate clients to include more of the community, and (c) research be done to increase the accuracy of social validity measures.

Hawkins (1991) also proposed changes to improve social validity methods. First, he suggested the term "consumer satisfaction" be used rather than social validity, because the latter does not assess validity as much as it asks for a second opinion (i.e., the opinion of the consumer in addition to that of the scientist). Second, he suggested we study effects on consumers in terms of the short-term and long-term benefits and costs and emphasized that we should consider verbal reports of satisfaction useful only to the extent that they are correlated with the ultimate benefits of an intervention.

It is clear from the above discussion that more refined techniques for measurement of consumer satisfaction are needed in both applied behavior analysis and TQM. The development of objective means of assessing consumer responses would provide a more effective social validity tool for behavior analysts and an improved consumer assessment technology for TQM. It is also clear that further research on social validity by behavior analysts could improve the chances of adoption of behavioral methods by mainstream management, which is dominated by interest in total quality methods.

Linking the management system to consumer needs. As Mawhinney (1992) noted, SPC is more

than a statistical technique; it is a management philosophy prescribing an organizational culture that supports quality as a mission. With respect to this level of activity, Mawhinney proposed that operant metacontingencies (Glenn, 1988) can explain the relationship, or lack of it, between individual behaviors and survival of the organization. He considered the contributions of individual workers to a quality culture in terms of value for survival of the organization in a global marketplace and indicated that applied behavior analysts should strive to increase job security and the viability of U.S. firms by providing technology with which survival-related practices can be strengthened.

Unfortunately, operant analyses at the level of organizational performance are not well developed. General rules for specifying an organizational mission and linking it to individual performance have been described (e.g., Crowell & Anderson, 1982; Gilbert, 1978; Smith & Chase, 1990), but few studies have tested interventions of this scope. Thus, contributions of behavior analysis to organization-wide change have been relatively crude. This shortcoming is substantiated by a recent review of the organizational behavior management (OBM) literature, which reported little emphasis on behaviors of top management but relatively extensive attention to the behaviors of line workers and middle management (Balcazar, Shupert, Daniels, Mawhinney, & Hopkins, 1989).

Research on systematic methods for large-scale analysis of performance patterns is needed to increase the relevance and value of behavioral contributions to future quality movements. The current model of individual performance management depends heavily on the effects of immediate consequences and antecedents on the performances of single individuals. This framework must be extended to consider the effects of relatively remote events (e.g., delayed outcomes) on performance and the extent to which changes affect groups of workers within an organization in similar ways. Behavioral systems analysis models such as the total performance system (Brethower, 1982) and Gilbert's (1978) performance engineering matrix specify how consumer criteria can be assessed and linked to internal organizational objectives to provide a basis for this type of work (for more information on these models, see Redmon & Agnew, 1991, and Redmon & Wilk, 1991). In addition, recent analyses of rule-governed behavior (e.g., Agnew & Redmon, in press) and goal-directed systems (Malott & Garcia, 1987) provide a beginning for extending existing technology.

Measurement of variability. Mawhinney (1992) described the relationship between applied behavior analysis and SPC in terms of measurement methods and cause–effect models. Deming relied on objective measures of product/service quality and, through careful observation, identified causes that could be manipulated to change outcomes. Furthermore, Deming applied steady-state data, much like those of within-subject research designs, to make decisions about functional relationships. A process is said to be in control when a steady state of functioning is detected using measures of critical outcomes. Changes in a steady state depicted on an SPC control chart represent changes in controlling variables in much the same way as variations in graphed data patterns signal changes in performance as a function of environmental phenomena in applied behavior analysis.

Certainly, applied behavior analysis has much to offer in the measurement area. Precise measurement of individual performance across time is the hallmark of behavior analysis methods. This knowledge of measurement techniques and functional relationships in cause–effect sequences could help to strengthen SPC quality control methods. This is particularly true where the output of a system is human behavior (e.g., service provided by bank tellers). In such cases, precise behavioral observation could produce data equivalent to those of manufacturing for use in SPC control systems for human performance.

SPC and TQM describe specific reinforcement and punishment contingencies only in general terms (e.g., recognition of contributions by workers) and apply little behavioral research regarding the effects of consequences on performance (Redmon & Dickinson, 1987). Thus, applied behavior analysts could add a powerful management technology to large-

scale quality programs by facilitating the adoption of existing contingency-management technology by quality control engineers and managers. However, this will require a greater emphasis on factors that influence adoption of behavioral technology.

It has been proposed that behavior analysts focus too heavily on procedural and technological elements and do not emphasize adoption to the same extent (Redmon, 1991). In this context, Bailey (1991) suggested a strategy for improving adoption.

> One reason we have not seen widespread adoption of behavioral technology is that we have not properly analyzed the needs of our potential consumers, and we have not marketed and packaged our product in such a way that it is readily accepted and easily used. Actually, we could use a consensus conference to address these issues (i.e., value systems associated with behavior analysis, ways to promote the positive side-effects of the use of reinforcement, developing a public relations strategy for the 1990s, etc.), and we also need a great deal of research on the marketing of behavior analysis. (p. 447)

Based on the above discussion, it is clear that an extensive research base exists and is available for immediate use in quality improvement. Further, it is apparent that the challenge lies in promoting the adoption of this technology by those who implement quality improvement methods.

Emphasis on employee participation. Team building and TQM are inseparable in many accounts of total quality systems (e.g., Scholtes, 1988). Team building is the primary way in which employee participation is arranged within TQM. This methodology also meets the criteria for "breaking down barriers," as specified by Deming (1982). Effective team-based strategies require that small groups of employees meet on a regular basis and work together to monitor their own effectiveness and solve organizational problems. The requirements of teams vary considerably from one application to another and include the following types: (a) advice and involvement, (b) production and service, (c) projects and development, and (d) action and negotiation (Sundstrom, De Meuse, & Futrell, 1990). In the case of quality-based teams, employees at all levels are members of teams that determine ways of improving quality and devise plans for studying and implementing needed changes. The extent to which teams are given power and authority varies considerably across organizations. Semiautonomous groups are overseen by a supervisor; self-managing groups choose their own leaders from within and have the authority to assign work to team members; self-designing teams are given authority over their own work and are given freedom to represent an organization to outsiders (Sundstrom et al., 1990).

Within behavior analysis, Fawcett (1991) has addressed participation issues as part of a discussion of values in community research. Fawcett encouraged applied behavior analysts to (a) arrange collaborative relationships with subjects, (b) give priority to issues of importance to participants (versus those of concern only to the science), (c) build programs that are sustainable given the resources and competing demands of the environment in which they are implemented, (d) set up programs so they can be operated by local change agents, (e) communicate program requirements and results to participants in an understandable and honest manner, and (f) ensure that programming improves current conditions, prevents future problems, and empowers participants to affect their own lives. These components could well be used as criteria for effective participative management methods, including team building, and provide a set of functional criteria for evaluating worker involvement in organization-wide quality control programs. Certainly, many team-building efforts have been successful. However, few have identified the general outcomes to be achieved by team development or other participative methods. Behavior analysts could help to define the essential features of these methods to ensure that workers are given a truly participative role in quality management. Given this technology, one could ask not just whether teams had been set up, but what functional contributions the teams make to their members and to the organization.

Participative management systems and team building also may reduce countercontrol by organization members and increase the chances of adoption and maintenance in the long term (Miller, 1991). Thus, collaborative efforts, such as those suggested by Fawcett (1991), have practical implications for the success of quality improvement interventions, in that they permit workers to make adjustments in program requirements to reduce unnecessary problems in both the design and implementation stages.

Summary and Conclusions

The points made here describe important ways in which behavior analysts can contribute to the total quality movement and improve the status of behavioral methods in traditional management areas. Furthermore, the contributions that would produce the greatest success in total quality management also promise to benefit behavior analysis in general (e.g., improved cooperation engendered by better consumer satisfaction assessments, reduced countercontrol through subject participation). Finally, it seems that an organized effort to build our research base and market behavior-change technology could well bring powerful methods to the public at a time when they can contribute a great deal to the good of the culture; this is an unusual opportunity for behavior analysis to demonstrate its effectiveness in solving social problems.

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